92. (Twice Amended) A hydroentangled nonwoven fabric consisting [essentially] of continuous filaments, said fabric comprising a plurality of layers of initially thermally point bonded continuous filament nonwoven fabrics, each of said layers comprised of polyester and having a basis weight of between 15 to 100 g/m$^2$, said layers being hydroentangled on a three-dimensional image transfer device together to form a cohesive and durable fabric having a basis weight of between about 50 to 600 g/m$^2$, said hydroentangled fabric being characterized by the substantial absence of thermal bonding in the layers and characterized by continuous filaments hydroentangled into an arrangement of packed loops and spirals that are substantially free of filament breakage and knotting, said cohesive and durable fabric being jet dyed.

## REMARKS

Responsive to the Official Action mailed April 23, 2002, applicants have amended the claims of their application in an earnest effort to place this case in condition for allowance. Specifically, claim 5 has been canceled, and claims 1, 13, 45, 47, 51, 76, and 92 amended. Reconsideration is respectfully requested.

In the Action, the Examiner noted that the claim language calling for the present fabric structure as "consisting essentially of" did not provide sufficient differentiation of the present product from structures having additional fibrous components. Accordingly, all of the claims have been amended to specify that the recited fabric "consists of" the recited substantially continuous filaments. It is believed that this revision of the claim language acts to further patentably distinguish the present fabric structure from the prior art cited by the Patent Examiner.

In the Action, the Examiner also noted the language in claims 45 and 47 specifying that the recited filaments are "free of filament ends intermediate end portions of the fabric". In an effort to advance prosecution, this claim language has been deleted from these two claims. However, by way of clarification, this claim language is intended to underscore the fact that intermediate end portions of a piece of fabric, where cutting of the fabric would inevitably result in a large plurality of filament ends, there is a substantial absence of filament ends, i.e., the filaments of the claimed fabric are substantially continuous. This is an important aspect of the present invention, in that it differentiates the present fabric from fabrics formed such as from staple length fibers, typically having finite lengths on the order of ½ to 1½ inches. Rather, the melt-extruded filaments of the present fabric are maintained in substantially continuous form, with the hydroentanglement of such filaments acting to create interengaged pack loops, spirals, and like integration, *without knotting of end portions of the filaments*.

In the Action, the Examiner rejected claims 45-51 under 35 U.S.C. §112. In view of the revisions to claims 45 and 47, it is believed that this rejection can be withdrawn with respect to these claims, and the claims depending therefrom. In the Action, the Examiner noted the language of claim 51 which was unclear. Claim 51 has been revised to clarify that plural ones of the recited laminations consist of polyethylene filaments, while another one of the laminations, positioned therebetween, consist of polypropylene filaments. This claim has been further revised to specify that the one lamination consisting of polypropylene filaments comprises about 10% to 60% of the weight of the fabric. In contrast, the ones of the laminations each consisting of polyethylene filaments together comprise from about 40% to 90% of the weight of the fabric. It is believed that the language of this claim has been

clarified, but applicants would be pleased to consider any further revisions as the Examiner deems appropriate.

In rejecting the pending claims under 35 U.S.C. §103, the Examiner has relied upon U.S. Patent No. 4,808,467, to Suskind et al., and U.S. Patent No. 6,200,669, to Marmon et al. However, it is respectfully submitted that neither of these references contemplate the formation of a nonwoven fabric by hydroentanglement, wherein the fabric consists of substantially continuous, melt-extruded filaments which are rearranged and integrated under the influence of hydroentanglement, while substantially avoiding breakage of individual ones of the filaments. As discussed in the present application, the resultant fabric exhibits unique physical characteristics, which characteristics are believed to underscore the fundamental differences of the present fabric from the prior art.

It should be noted that formation of the recited fabric, including interengaged packed loops, by hydroentanglement of the substantially endless thermoplastic filaments provides a fabric structure which can be very efficiently formed, and which exhibits physical characteristics which are quite distinct from other types of fabrics. It is important to note that melt-extrusion of such filaments can be efficiently effected, with routine forming speeds as high as 1,000 meters per minute. Filaments can be drawn and quenched very quickly to get the desired crystalline alignment.

It is important to note an aspect of the present invention which is distinct from hydroentangled fabrics comprising staple length fibers. Hydroentanglement of staple length fibers typically creates "knots" as the ends of the relatively short fibers are entangled under the influence of high-pressure water jets. When this type of fabric is subjected to an elongation force, these knots tend to tighten, and then fail.

In contrast, the hydroentangled filaments of the present fabric include "loops" (not fiber ends) which are entwined by hydroentanglement, with the fabric then tending to elongate, when subjected to force, by disentanglement of these loops. The fabric exhibits a distinctly different stress-strain curve than hydroentangled staple fiber fabrics. Thus, the present fabric permits the desired tensile strengths to be achieved, permitting lighter weight fabrics than those which are formed such as from staple fibers.

In comparison to typical spunbond fabrics comprising continuous filaments, it has typically been necessary heretofore to heat-bond such fabrics to achieve the desired fabric strength. However, the present fabric can achieve the desired fabric strength without resort to the same degree of thermal bonding, which thermal bonding can significantly inhibit efficient manufacture, since production lines cannot be run at speeds which are as high as those by which the melt-extruded filaments can be formed and collected. Additionally, the typical heat-bonding of spunbond fabrics is avoided, which can result in the fabric exhibiting a "crunchy" texture, which results from the heat-bonding. Heat-bonded regions (sometimes referred to as "windows") are similarly avoided by formation of the present hydroentangled filament fabric.

As noted by the Examiner, Suskind et al. contemplates a fabric for medical applications which is produced by hydraulically entangling wood pulp and staple fibers with a continuous filament base web. Thus, in clear distinction from applicants' invention as claimed, Suskind et al. *does not* contemplate a fabric which consists of substantially continuous filaments. Rather, it is understood that Suskind contemplates that the continuous filament web acts as a support or carrier for the wood pulp and textile length fibers that are integrated therewith to form the contemplated composite fabric.

In the Action, the Examiner acknowledges that Suskind et al. is silent with respect to the claimed interengaged packed loops. However, applicants respectfully disagree that it is reasonable to presume that such packed loops are inherent to the disclosure of Siskind et al. Suskind et al. is specifically limited in its teachings to the formation of a composite fabric by integration of wood pulp and staple length fibers with an associated continuous filament web. *This is the object of Suskind et al.*

As noted in applicants' previous response, Suskind et al. specifically contemplates that the continuous filament web maintain sufficient integrity in order to act as the intended support or carrier for the associated wood pulp and staple length fibers. In this regard, it is noted that Suskind specifically contemplates:

> Bonding of the continuous filament web is essential when produced in a separate step, in which case the bonding area should not exceed about 15% of the total area of the web for best results. Bonding in the range of 6% to 10% area bonded is preferred (column 3, lines 11-16).

As will be recognized by those skilled in the art, when the filament/wood pulp/staple length fiber structure of Suskind et al. is subjected to hydraulic energy, comparable to that used in practicing the present invention, the energy would be absorbed by the integration of the wood pulp and staple fibers into the spunbond web structure. In contrast, hydroentanglement of a filamentary web employed for practicing the present invention results in rearrangement and entanglement of the filaments themselves, without absorption of energy by associated pulp and or fibrous layers. Thus, it is respectfully submitted that the claimed interengaged packed loops of applicants' invention would not be inherent in, or obvious from, the teachings of Suskind et al.

In the Action, the Examiner has further relied upon the Marmon et al. reference in rejecting the pending claims. Marmon et al. contemplates use of multi-component fibers, sometimes referred to as "splittable" fibers, which fibers can be separated into their constituent components under the influence of certain processing conditions. As noted in applicants' previous response, Marmon et al. contemplates that multi-component fibers are *bonded* to form a bonded substrate of multi-component fibers. The patent goes on to state:

> The bonded substrate of multi-component fibers may then be entangled creating a highly entangled nonwoven fabric with significant separation of individual components from the unitary multi-component fibers.

It is respectfully submitted that this patent does not contemplate hydroentanglement of continuous filaments provided from an unbonded or lightly bonded web structure. Rather, this patent specifically contemplates that the multi-component fibers be bonded prior to hydroentanglement. Marmon et al. states:

> In this regard, it has been discovered that by bonding the continuous unitary multi-component filaments prior to entangling, the resulting nonwoven fabric has a higher degree of fiber separation and, therefore, improved tactile and physical characteristics. *Moreover, the added integrity imparted to the web by bonding significantly reduces and/or eliminates problems associated with the multi-component fibers being entwined on the hydroentangling apparatus* (column 9, lines 26 *et seq.*; emphasis supplied).

Thus, it is respectfully submitted that Marmon et al. *teaches away* from the present invention as claimed, wherein hydroentanglement of a lightly bonded continuous filament web acts to separate the individual filaments, without substantial breakage, and thereafter integrate the filaments into a cohesive fabric structure. As is evident from the teachings of Marmon et al., this patent contemplates that *bonding* of the multi-component fibers, prior to hydroentanglement, facilitates separation of the fibers into their individual components;

disassociation of the bonds, while maintaining the integrity of the individual filaments, is not contemplated.

In summary, it is respectfully maintained that there is a clear absence of teachings in the prior art of applicants' novel fabric structures, which consist of continuous filaments which have been hydroentangled to form fabrics exhibiting unique physical characteristics. Accordingly, formal allowance of claims 1-4, 6-13, 45-51, and 76-92 is believed to be in order and is respectfully solicited. Should the Examiner wish to speak with applicants' attorneys, they may be reached at the number indicated below.

Respectfully submitted,

By 

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CERTIFICATE OF MAILING

I hereby certify that this paper is being deposited with the United States Postal Service with sufficient postage at First Class Mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231 on **August 23, 2002.**